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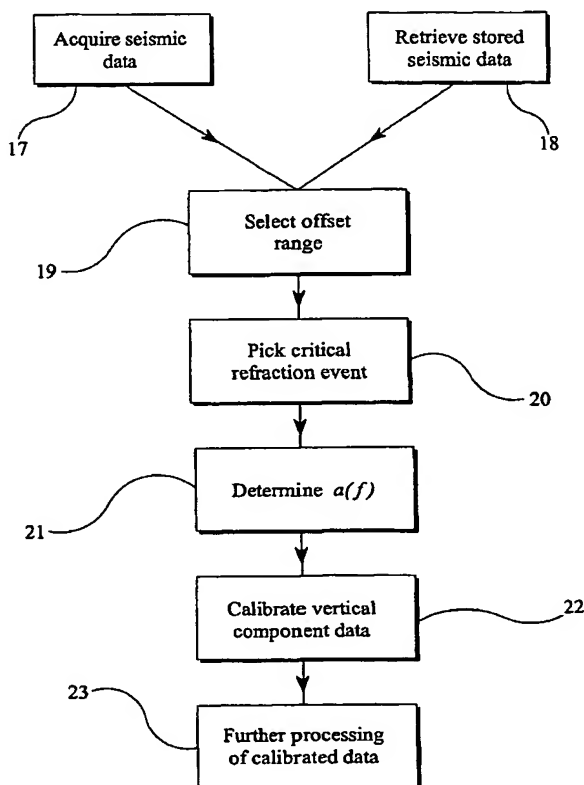
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[Continued on next page]

(54) Title: A METHOD OF AN APPARATUS FOR PROCESSING SEISMIC DATA AND DETERMINING A CALIBRATION FILTER



(57) Abstract: A method determining a calibration filter to calibrate a first component of multi-component seismic data relative to a second component of the seismic data comprises determining the calibration filter from a portion of the seismic data that contains only events arising from critical refraction of seismic energy. The method is particularly suitable for long-offset data, since the first arrival will be a critical refraction event and an automatic picking method may be used. The present invention also provides a wavenumber-dependent calibration filter that is obtained from a calibration filter obtained from data in one offset range and another calibration filter obtained from data in another offset range.



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## INTERNATIONAL SEARCH REPORT

 Internat      Application No  
 PCT/GB 03/00052

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7      G01V1/36

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**
 Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7      G01V

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SCHALKWIJK K.M ET AL.: "Application of two-step decomposition to multicomponent ocean-bottom data : theory and case study" JOURNAL OF SEISMIC EXPLORATION, no. 8, 1999, pages 261-278, XP008017686 cited in the application	10,11, 13,15
A	the whole document	1
A	WO 01 01170 A (CONTINUUM RESOURCES CORP) 4 January 2001 (2001-01-04) page 3, line 15 - line 24; claim 1	1,10, 13-15
P,X	US 2002/118602 A1 (STOFFA PAUL L ET AL) 29 August 2002 (2002-08-29) paragraphs '0010!, '0034!, '0041!, '0047!-'0049! -/--	8,16

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

28 July 2003

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08.08.03

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# INTERNATIONAL SEARCH REPORT

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PCT/GB 03/00052

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 101 448 A (AMUNDSEN LASSE ET AL) 8 August 2000 (2000-08-08) claim 1	8,16
T	YANBIN WANG ET AL: "Separation of P- and S-wavefields from wide angle component OBC data for a basalt model" GEOPHYSICAL PROSPECTING, vol. 51, 2003, pages 233-245, XP002249283 abstract	8,16

# INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/GB 03/00052

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-7,10-15

A method of (and the corresponding apparatus for) processing multi-component seismic data comprising the step of selecting a portion of the seismic data either containing only events arising from critical refraction of seismic energy or containing only upwardly propagating seismic energy.

2. Claims: 8-9,16-20

A method of (and the corresponding apparatus for) processing multicomponent seismic data comprising the step of determining calibration filters from 2 portions of the seismic data with different offset ranges.

# INTERNATIONAL SEARCH REPORT

Internationa Publication No  
PCT/GB 03/00052

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